

IN THE CLAIMS:

Please insert the following header before claim 1:

What is claimed is:

1. (CURRENTLY AMENDED) — ~~Process~~ A process for the production and purification of lactide, characterized in that ~~wherein~~, starting from an aqueous solution of lactic acid or of lactic acid derivatives, the stages comprise:
 - a) evaporation of ~~the~~ free water and of a portion of the water of constitution until oligomers having a molecular mass of between 400 and 2000 amu, a total acidity as lactic acid equivalent of between 119 and 124.5% and an optical purity, expressed as L-lactic acid, of between 90 and 100% are obtained;
 - b) feeding ~~the~~ a mixture comprising a depolymerization catalyst and the oligomers obtained in step a) to a depolymerization reactor ~~with production of~~ to produce:
 - b1) a lactide-rich ~~vapour~~ vapor phase, and
 - b2) an oligomer-rich liquid residue;
 - c) selective condensation of the lactide-rich ~~vapour~~ ~~(b1)~~ vapor with recovery, in the liquid form, of a crude lactide product freed from the volatile compounds;
 - d) melt crystallization of the crude lactide product (e), ~~with production of~~ to produce a purified lactide fraction having a residual acidity of less than 10 meq/kg, a water content of less than 200 ppm and a meso-lactide content of less than 1%; and
 - e) aqueous treatment of the residual fractions from the step of melt crystallization, consisting of:
 - e1) extractive and controlled crystallization of ~~these~~ the residue fractions in an aqueous medium, with control of the geometry of ~~the~~ crystals formed and with segregation of ~~the~~ a lactide suspension towards ~~the~~ a solid phase and of ~~the~~ impurities towards ~~the~~ a liquid phase, ~~so as~~ to carry out aqueous extraction of the impurities;
 - e2) separation of the suspension of crystals ~~(e1)~~ formed in step e1) from the liquid phase and then draining, ~~which separates to separate~~ a wet cake rich in lactide crystals from a liquid phase depleted in lactide and laden with impurities; and
 - e3) drying the wet cake ~~(e2)~~, ~~which provides the~~ to provide prepurified lactide.

2. (CURRENTLY AMENDED) —~~Process~~A process for the production and purification of lactide, characterized in that ~~wherein~~, starting from an aqueous solution of lactic acid or of lactic acid derivatives, the stages comprise:

- a) evaporation of the free water and of a portion of the water of constitution until oligomers having a molecular mass of between 400 and 2000 amu, a total acidity as lactic acid equivalent of between 119 and 124.5% and an optical purity, expressed as L-lactic acid, of between 90 and 100% are obtained;
- b) feeding ~~the~~a mixture comprising a depolymerization catalyst and the oligomers obtained in ~~step~~ a) to a depolymerization reactor ~~with production of~~ to produce:
 - b1) a lactide-rich ~~vapour~~vapor phase, and
 - b2) an oligomer-rich liquid residue;
- c) selective condensation of the lactide-rich ~~vapour~~ ~~(b1)~~vapor with recovery, in the liquid form, of a crude lactide product freed from the volatile compounds;
- d) aqueous treatment of the crude lactide product resulting from ~~(e)~~step c) consisting of:
 - d1) extractive and controlled crystallization in an aqueous medium, with control of the geometry of the crystals formed and with segregation of ~~the~~a lactide suspension towards ~~the~~a solid phase and of ~~the~~ impurities towards ~~the~~a liquid phase, so as to carry out aqueous extraction of the impurities;
 - d2) separation of the suspension of crystals ~~(d1)~~formed in step d1) from the liquid phase and then draining, ~~which separates to separate~~ a wet cake rich in lactide crystals from a liquid phase depleted in lactide and laden with impurities; and
 - d3) drying the wet cake ~~(d2)~~, ~~which provides to provide~~ a purified lactide; and
- e) melt crystallization of the purified lactide ~~(d3)~~, ~~with production of~~ formed in step d3) to produce a purified lactide fraction having a residual acidity of less than 10 meq/kg, a water content of less than 200 ppm and a meso-lactide content of less than 1%.

3. (CURRENTLY AMENDED) —~~Process A~~ process for the production of polylactide, characterized in that ~~wherein~~ the stages of production and of purification of lactide, starting from an aqueous solution of lactic acid or of lactic acid derivatives, comprise:

- a) evaporation of the free water and of a portion of the water of constitution until oligomers having a molecular mass of between 400 and 2000 amu, a total acidity as lactic acid equivalent of between 119 and 124.5% and an optical purity, expressed as L-lactic acid, of between 90 and 100% are obtained;
- b) feeding ~~the~~a mixture comprising a depolymerization catalyst and the oligomers obtained in step a) to a depolymerization reactor ~~with production of~~ to produce:
 - b1) a lactide-rich ~~vapour~~vapor phase, and
 - b2) an oligomer-rich liquid residue;
- c) selective condensation of the lactide-rich ~~vapour~~(b1)vapor with recovery, in ~~the~~a liquid form, of a crude lactide product freed from the volatile compounds;
- d) melt crystallization of the crude lactide product (e), ~~with production of~~ formed in step c) to produce a purified lactide fraction having a residual acidity of less than 10 meq/kg, a water content of less than 200 ppm and a meso-lactide content of less than 1%;
- e) aqueous treatment of the residual fractions from the melt crystallization, consisting of:
 - e1) extractive and controlled crystallization of ~~these~~the residual fractions in an aqueous medium, with control of the geometry of the crystals formed and with segregation of ~~the~~a lactide suspension towards ~~the~~a solid phase and of ~~the~~the impurities towards ~~the~~a liquid phase, so as to carry out aqueous extraction of the impurities;
 - e2) separation of the suspension of crystals (e1)formed in step e1) from the liquid phase and then draining, ~~which separates to separate~~ a wet cake rich in lactide crystals from a liquid phase depleted in lactide and laden with impurities; and
 - e3) drying the wet cake (e2), ~~which provides the~~to provide prepurified lactide;
- f) polymerization of the lactide to polylactide.

4. (CURRENTLY AMENDED) -~~Process A~~ process for the production of polylactide, characterized in that ~~the~~wherein stages of production and of purification of lactide, starting from an aqueous solution of lactic acid or of lactic acid derivatives, comprise:

- a) evaporation of ~~the~~ free water and of a portion of the water of constitution until oligomers having a molecular mass of between 400 and 2000 amu, a total acidity as lactic acid equivalent of between 119 and 124.5% and an optical purity, expressed as L-lactic acid, of between 90 and 100% are obtained;
- b) feeding ~~the~~a mixture comprising a depolymerization catalyst and the oligomers obtained in step a) to a depolymerization reactor ~~with production of~~ to produce:
 - b1) a lactide-rich ~~vapour~~vapor phase, and
 - b2) an oligomer-rich liquid residue;
- c) selective condensation of the lactide-rich ~~vapour~~ (b1)vapor with recovery, in the liquid form, of a crude lactide product freed from ~~the~~ volatile compounds;
- d) aqueous treatment of the crude lactide product resulting from ~~(e)step c~~ consisting of:
 - d1) extractive and controlled crystallization in an aqueous medium, with control of the geometry of ~~the~~ crystals formed and with segregation of ~~the~~a lactide suspension towards ~~the~~a solid phase and of ~~the~~ impurities towards ~~the~~a liquid phase, so as to carry out aqueous extraction of the impurities;
 - d2) separation of the suspension of crystals ~~(d1)formed in step d1~~ from the liquid phase and then draining, ~~which separates to separate~~ a wet cake rich in lactide crystals from a liquid phase depleted in lactide and laden with impurities; and
 - d3) drying the wet cake ~~(d2), which provides to provide~~ a purified lactide;
- e) melt crystallization of the purified lactide ~~(d3)~~, ~~with production of~~ to produce a purified lactide fraction having a residual acidity of less than 10 meq/kg, a water content of less than 200 ppm and a meso-lactide content of less than 1%; and
- f) polymerization of the lactide to polylactide.

5. (CURRENTLY AMENDED) —~~Process~~The process according to ~~any one of the preceding claims, characterized in that~~claim 1, wherein the starting lactic acid derivatives comprise lactic acid esters.

6. (CURRENTLY AMENDED) —~~Process~~The process according to ~~one of Claims 1 to 4, characterized in that~~claim 1, wherein the starting lactic acid derivatives comprise a mixture of lactic acid and of one or more lactic acid esters.

7. (CURRENTLY AMENDED) —~~Process~~The process according to ~~any one of the preceding claims, characterized in that~~claim 1, wherein the crude lactide product is enriched in prepurified lactide fractions originating from the aqueous treatment of the residual fractions from the step of melt crystallization.

8. (CURRENTLY AMENDED) —~~Process~~The process according to ~~any one of the preceding claims, characterized in that~~claim 1, wherein the prepurified lactide resulting from the aqueous treatment can be recycled at any point induring the production and purification of purified lactide.

9. (CURRENTLY AMENDED) —~~Process~~The process according to ~~any one of the preceding claims, characterized in that~~the claim 1, wherein a content of D-lactide during the progression of the process is controlled by polymerization by ring opening of the prepurified lactide.

10. (CURRENTLY AMENDED) —~~Process~~The process according to ~~any one of the preceding claims, characterized in that~~claim 1, wherein the prepurified lactide exhibits a residual water content of between 50 and 1000 ppm, a total lactide content of between 70 and 99%, a content of lactic acid and lactic acid oligomers of between 0 and 5% and a meso-lactide content of between 0 and 15%.

11. (CURRENTLY AMENDED) —~~Process~~The process for the production of polylactide according to Claim 3—or 4, characterized in thatwherein the polymerization of at least one of the purified lactide and/or the prepurified lactide comprises the stagessteps of:

- a) of addition of a catalyst or a mixture of catalysts to the lactide to form a mixture;
- b) of initiation of the prepolymerization with addition, to the mixture (a),formed in step a) of optional comonomers, of oligomers, of prepolymers, of stabilizers, of fillers, of reinforcing agents or of polymerization moderators; and
- c) of polymerization in an extruder with addition of optional comonomers, of oligomers, of prepolymers, of stabilizers, of fillers, of reinforcing agents or of polymerization moderators.

12. (CURRENTLY AMENDED) —~~Process~~The process for the production of polylactide according to Claim 3—or 4, characterized in thatwherein the polymerization of at least one of the purified lactide and/or the prepurified lactide comprises the stagessteps of:

- a) of addition of a catalyst or a mixture of catalysts to the lactide to form a mixture;
- b) of polymerization in an extruder with addition, to the mixture (a),formed in step a) of optional comonomers, of oligomers, of prepolymers, of stabilizers, of fillers, of reinforcing agents or of polymerization moderators.

13. (CURRENTLY AMENDED) —~~Process~~The process for the production of polylactide according to ~~Claims 3, 4, 11 or 12~~Claim 3, characterized in thatwherein, during the purification and the production of polylactide, the recycled fractions of lactic acid or of itsthe lactic acid derivatives are introduced in the purification stage of the process for the production of lactic acid or of itsthe lactic acid derivatives.

14. (CURRENTLY AMENDED) —~~Process~~The process for the production of lactide according to Claim 1—or 2, characterized in thatwherein, during the production and the purification of lactide, the recycled fractions of lactic acid or of itsthe lactic acid derivatives are introduced in the purification stage of the process for the production of lactic acid or of itsthe lactic acid derivatives.

15. (NEW) The process according to claim 2, wherein the lactic acid derivatives comprise lactic acid esters.

16. (NEW) The process according to claim 2, wherein the lactic acid derivatives comprise a mixture of lactic acid and one or more lactic acid esters.

17. (NEW) The process according to claim 2, wherein the crude lactide product is enriched in prepurified lactide fractions originating from the aqueous treatment of the residual fractions from the step of melt crystallization.

18. (NEW) The process according to claim 2, wherein the prepurified lactide resulting from the aqueous treatment can be recycled at any point during the production and purification of lactide.

19. (NEW) The process according to claim 2, wherein a content of D-lactide during the process is controlled by polymerization by ring opening of the prepurified lactide.

20. (NEW) The process according to claim 2, wherein the prepurified lactide exhibits a residual water content of between 50 and 1000 ppm, a total lactide content of between 70 and 99%, a content of lactic acid and lactic acid oligomers of between 0 and 5% and a meso-lactide content of between 0 and 15%.

21. (NEW) The process according to claim 3, wherein the lactic acid derivatives comprise lactic acid esters.

22. (NEW) The process according to claim 3, wherein the lactic acid derivatives comprise a mixture of lactic acid and one or more lactic acid esters.

23. (NEW) The process according to claim 3, wherein the crude lactide product is enriched in prepurified lactide fractions originating from the aqueous treatment of the residual fractions from the step of melt crystallization.

24. (NEW) The process according to claim 3, wherein the prepurified lactide resulting from the aqueous treatment can be recycled at any point during the production and purification of lactide.

25. (NEW) The process according to claim 3, wherein a content of D-lactide during the process is controlled by polymerization by ring opening of the prepurified lactide.

26. (NEW) The process according to claim 3, wherein the prepurified lactide exhibits a residual water content of between 50 and 1000 ppm, a total lactide content of between 70 and 99%, a content of lactic acid and lactic acid oligomers of between 0 and 5% and a meso-lactide content of between 0 and 15%.

27. (NEW) The process according to claim 4, wherein the lactic acid derivatives comprise lactic acid esters.

28. (NEW) The process according to claim 4, wherein the lactic acid derivatives comprise a mixture of lactic acid and one or more lactic acid esters.

29. (NEW) The process according to claim 4, wherein the crude lactide product is enriched in prepurified lactide fractions originating from the aqueous treatment of the residual fractions from the step of melt crystallization.

30. (NEW) The process according to claim 4, wherein the prepurified lactide resulting from the aqueous treatment can be recycled at any point during the production and purification of lactide.

31. (NEW) The process according to claim 4, wherein a content of D-lactide during the process is controlled by polymerization by ring opening of the prepurified lactide.

32. (NEW) The process according to claim 4, wherein the prepurified lactide exhibits a residual water content of between 50 and 1000 ppm, a total lactide content of between 70 and 99%, a content of lactic acid and lactic acid oligomers of between 0 and 5% and a meso-lactide content of between 0 and 15%.

33. (NEW) The process for the production of polylactide according to Claim 4, wherein the polymerization of at least one of the purified lactide and the prepurified lactide comprises the steps of:

- a) addition of a catalyst or a mixture of catalysts to the lactide to form a mixture;
- b) initiation of the prepolymerization with addition to the mixture formed in step a) of optional comonomers, oligomers, prepolymers, stabilizers, fillers, reinforcing agents or polymerization moderators; and
- c) polymerization in an extruder with addition of optional comonomers, oligomers, prepolymers, stabilizers, fillers, reinforcing agents or polymerization moderators.

34. (NEW) The process for the production of polylactide according to Claim 4, wherein the polymerization of at least one of the purified lactide and the prepurified lactide comprises the steps of:

- a) addition of a catalyst or a mixture of catalysts to the lactide to form a mixture;
- b) polymerization in an extruder with addition to the mixture formed in step a) of optional comonomers, oligomers, prepolymers, stabilizers, fillers, reinforcing agents or polymerization moderators.

35. (NEW) The process for the production of polylactide according to Claim 4, wherein, during the purification and the production of polylactide, the recycled fractions of lactic acid or the lactic acid derivatives are introduced in the purification stage of the process for the production of lactic acid or the lactic acid derivatives.

36. (NEW) The process for the production of polylactide according to Claim 11, wherein, during the purification and the production of polylactide, the recycled fractions of lactic acid or the lactic acid derivatives are introduced in the purification stage of the process for the production of lactic acid or the lactic acid derivatives.

37. (NEW) The process for the production of polylactide according to Claim 12, wherein, during the purification and the production of polylactide, the recycled fractions of lactic acid or the lactic acid derivatives are introduced in the purification stage of the process for the production of lactic acid or the lactic acid derivatives.

38. (NEW) The process for the production of lactide according to Claim 2, wherein, during the production and the purification of lactide, the recycled fractions of lactic acid or the lactic acid derivatives are introduced in the purification stage of the process for the production of lactic acid or the lactic acid derivatives.

39. (NEW) The process according to Claim 5, wherein the crude lactide product is enriched in prepurified lactide fractions originating from the aqueous treatment of the residual fractions from the step of melt crystallization.

40. (NEW) The process according to Claim 6, wherein the crude lactide product is enriched in prepurified lactide fractions originating from the aqueous treatment of the residual fractions from the step of melt crystallization.

41. (NEW) The process according to Claim 5, wherein the prepurified lactide resulting from the aqueous treatment can be recycled at any point during the production and purification of lactide.

42. (NEW) The process according to Claim 6, wherein the prepurified lactide resulting from the aqueous treatment can be recycled at any point during the production and purification of lactide.

43. (NEW) The process according to Claim 7, wherein the prepurified lactide resulting from the aqueous treatment can be recycled at any point during the production and purification of lactide.

44. (NEW) The process according to Claim 5, wherein a content of D-lactide during the process is controlled by polymerization by ring opening of the prepurified lactide.

45. (NEW) The process according to Claim 6, wherein a content of D-lactide during the process is controlled by polymerization by ring opening of the prepurified lactide.

46. (NEW) The process according to Claim 7, wherein a content of D-lactide during the process is controlled by polymerization by ring opening of the prepurified lactide.

47. (NEW) The process according to Claim 8, wherein a content of D-lactide during the process is controlled by polymerization by ring opening of the prepurified lactide.

48. (NEW) The process according to Claim 5, wherein the prepurified lactide exhibits a residual water content of between 50 and 1000 ppm, a total lactide content of between 70 and 99%, a content of lactic acid and lactic acid oligomers of between 0 and 5% and a meso-lactide content of between 0 and 15%.

49. (NEW) The process according to Claim 6, wherein the prepurified lactide exhibits a residual water content of between 50 and 1000 ppm, a total lactide content of between 70 and 99%, a content of lactic acid and lactic acid oligomers of between 0 and 5% and a meso-lactide content of between 0 and 15%.

50. (NEW) The process according to Claim 7, wherein the prepurified lactide exhibits a residual water content of between 50 and 1000 ppm, a total lactide content of between 70 and 99%, a content of lactic acid and lactic acid oligomers of between 0 and 5% and a meso-lactide content of between 0 and 15%.

51. (NEW) The process according to Claim 8, wherein the prepurified lactide exhibits a residual water content of between 50 and 1000 ppm, a total lactide content of between 70 and 99%, a content of lactic acid and lactic acid oligomers of between 0 and 5% and a meso-lactide content of between 0 and 15%.

52. (NEW) The process according to Claim 9, wherein the prepurified lactide exhibits a residual water content of between 50 and 1000 ppm, a total lactide content of between 70 and 99%, a content of lactic acid and lactic acid oligomers of between 0 and 5% and a meso-lactide content of between 0 and 15%.